An Abstract

This thesis explores topological as well as analytical study on various metric spaces (partial, b, partial b, quasi partial b, partial S_b and rectangular partial b) raised not just as a generalization of metric space rather while applying theory of metric spaces in different field of study, for example; Theoretical Computer Sciences, Mathematical Biology etc.. All the spaces have been studied in an analytic flavour with special emphasis on fixed point theories. Results obtained during Ph. D. work are arranged in six chapters in this thesis and hope some of them will show the way for solving many unknown problems in these regard.

First chapter consists of necessary literature review on the aforementioned metric spaces which I have considered domain of my Ph. D. research work.

My own research work begins from second chapter which deals with topological study of partial metric spaces. A suitable definition of convergence of sequences in partial metric spaces has been considered. Star closed sets have been introduced to establish a variant of Cantor intersection theorem and Baire category theorem in partial metric space. Also this chapter deals with compactness and paracompactness of partial metric spaces. Induced partial metric spaces have been defined. It is shown that a partial metric space may fail to be paracompact but a induced partial metric space is paracompact. Also shown that compactness of a partial metric space can be studied via pairwise sequential compactness of bitopological space induced by that partial metric. Moreover Suzuki type fixed point theorem in partial metric spaces have been studied which in turn generalize the results by O. Popescu published in "*Cent. Eur. J. Math. 7(3), (2009), 529-538*".

Chapter three demonstrate a topological warmup of b-metric spaces. Cantor intersection theorem has been established in b-metric spaces. Versions of Banach and Kannan fixed point theorems have been established in the language of b-metric spaces and concluded with two more fixed point theorems using generalized and generalized weakly contractive mappings.

In chapter four fixed point theorem for expansive mapping in partial b-metric spaces have been studied. A variant of Banach and Kannan fixed point theorem have been

established in quasi partial b-metric spaces.

In fifth chapter, some remarks on the article by Nizar Souayah published in " An. St. Univ. Ovidius Constanta, 24(3), 2016, 351-362" have been explored under some weak condition. All the results of the above mentioned article have been rediscovered making the necessary changes and corrections, without using symmetrical condition. A Suzuki type fixed point theorem for multiple functions have been achieved using F-contraction in partial S_b-metric spaces. Also new type of mapping has been defined and studied fixed point theorems. Some examples are also provided in support of our results. Moreover a modification in the definition of partial S_b-metric space has been done and it is shown that b-metric can be achieved from a modified partial S_b-metric and completeness of both the spaces are equivalent and conclude with a fixed point theorem.

Lastly in chapter six rectangular partial b-metric space have been defined. It is proved that rectangular b-metric can be achieved from rectangular partial b-metric. Moreover it is shown that completeness of both the spaces are equivalent. An analog to Cantor intersection theorem has been established in such spaces. A variant of Banach fixed point theorem and Kannan fixed point theorem are also proved in these spaces.